Universal Gravity

$$F = \frac{G * m_1 * m_2}{d^2} \quad \textit{to find mass of an object}$$

$$G = 6.67 \times 10^{-11} \qquad wt = m * g$$

1) What is the gravitational force between two 6 kg. spherical masses that are 5 meters apart?

$\frac{G \cdot 6^2}{5^2} = 9.6048 \times 10^{-11}$ N

2) What is the gravitational force between them when they are 5×10^5 meters apart?

9.6048×10^{-21} N

3) Two large spheres are suspended close to each other. Their centers are 4 m apart. One mass weighs 9.8×10^4 N. The other mass has a weight of 1.98×10^2 N. What is the gravitational force that exists between them?

8.42×10^{-7} N

4) Two satellites of equal mass are put into orbit 30 m apart. The gravitational force between them is 2×10^{-7} N. a) What is the mass of each satellite? b) What is the initial acceleration given to each satellite by the force?

a) 1.64×10^3 kg b) $F/m = a = 1.22 \times 10^{-10}$ m/s^2

5) The mass of the Earth is 6×10^{24} kg. If the centers of the Earth and Moon are 3.9×10^8 m apart, the gravitational force between them is about 1.9×10^{20} N. What is the approximate mass of the Moon?

$\frac{GmM}{d^2} = 1.9 \times 10^{20}$ ∴Moon mass $= 7.22 \times 10^{22}$ kg

6) Use Newton's second law of motion to find the acceleration given to the Moon by the force in problem 5.

$a = \frac{F}{m} = \frac{1.9 \times 10^{20}}{7.22 \times 10^{22}}$ $0.0026\ 3$ m/s^2

7) The mass of an electron is 9.1×10^{-31} kg. The mass of a proton is 1.7×10^{-27} kg. The mass of a proton is 1.7×10^{-27} kg. They are about 1×10^{-10} m apart in a hydrogen atom. What force of gravitation exists between the proton and the electron of a hydrogen atom?

$F = \frac{G \cdot (1.7 \times 10^{-27})(9.1 \times 10^{-31})}{10^{-20}}$

$= 1.03 \times 10^{-47}$ N